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Comparative Study of Phytochemical Properties of Some Bio-Material (African Yam Bean, Pigeon Pea, Pawpaw Leaf Powder, Moringa Seed and Pawpaw Seed)

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ABSTRACT

The study was carried out to compare the phytochemical properties of Africa yam bean, pigeon pea, moringa seed, pawpaw leaf and pawpaw seed powder and the Significance of the phytochemicals in respect to the treatment of diseases were discussed. Phytochemicals were qualitatively analyzed from the plants ethanol extracts and the practical were done in Bro. Mike researchers Lab. Umuerim Extension Umudibia Nekede and the Standard phytochemical analysis methods were adopted. Preliminary screening of the Africa yam bean, pigeon pea, moringa seed, Pawpaw leaf and pawpaw seed powder revealed the presence of alkaloids, tannins, flavonoids, saponins, steroids, and in all the plants ethanol extracts. Africa yam bean contained all the phytochemicals except tannin, while there was absence of flavonoid, and Glycoside in pigeon pea. Tannins were also absent in the pawpaw seed and pawpaw seed extracts. There was also the absence of steroid and ncardiac glycosides in moringa. The quantitative analysis of the six selected phytochemicals revealed that there was a significant difference in the mean values of alkaloids and flavonoids contents of African yam bean plants. However, at Africa yam bean had the highest Alkaloids content while moringa seed had the highest flavonoids content. The Pawpaw leaf contained the highest tannins and Saponins was found highest in pawpaw leaf and pawpaw seed. Finally, the results justified the medicinal potentials of these plants in the treatment of diseases.

INTRODUCTION

The comparative method is often used in the early stages of the development of a branch of a science. It can help their search to ascend from the initial level of exploratory case studies to a more advance level of general theoretical mode invariances, such as causality or evolution. In comparative study you are examining two or more cases specimens, biomaterials event. On the basis of the target of your study you have to decide which are the interesting aspects, properties or attributes that you will have to note and record for each of the cases.[1] The final goal of research is usually to removal the systematic structure that is true not only for were studies but for the entire group where the cases came from. In other words, the goal is to generalize the finding.[2]

Phytochemicals (phyto means plant) are chemical compounds that occur naturally in the plants. These compounds are responsible for colour and other organoleptic properties. They have antioxidants, anti-cancer, anti-Inflammatory and pain-relieving properties. Salicin, etc. Antioxidants are chemical compounds are substance that inhibit oxidation or that retards deterioration by oxidation, especially of fat, oils, and foods. Some examples of antioxidants are vitamins A, C and E, β -carotene, enzymes catalase, superoxide, dismutase and various peroxidases. Antimicrobials are agents that kill microorganism or suppress their multiplication or growth, e.g. penicillin (Natural), Sulphonamides, nitroglycerine, etc. Antimicrobi alagents are used to treat infectious disease. [3,4,5]

This work is therefore focused on the evaluation and comparative of phytochemical contents of underutilized

edible and non-edible. The emergence and re-emergence of diseases has left researchers with no Option than to focus spot-light on the discovery of bioactive metabolites from medicinal plants to compliment synthetic orthodox drugs in the fight against diseases caused by infectious agents. The use of medicinal plants in the treatment of diseases has been in practice since ancient times in different parts of the world. Plants have the major advantage of still being the most effective and cheaper alternative sources of drugs [6,7]

A biomaterial is essentially a material that is used and adapted for a medical application. Biomaterials can have a benign function, such as being used for a heart valve, or may be bioactive; used for a more interactive purpose such as hydroxy-apatite coated hip implants (the Furlong Hip, by Joint Replacement instrument at Ltd, Sheffield is one such example – such implants are lasting upwards of twenty years). Biomaterials are also used every day in dental applications, surgery, and drug delivery. While a definition for the term 'biomaterial' has been difficult to formulate, more widely accepted working definitions include: "A biomaterial is any material, natural or man-made, that comprises whole or part of a living structure or biomedical device which performs, augments, or replaces a natural function. African yam bean (*Sphenostylis stenocarpa*) is an edible, underutilized Grain legumes widely cultivated in Africa that is used for man and animal nutrition. Like most grain legumes cultivated in Africa, African yam bean is rich in prate in, carbohydrates, fat, vitamins and minerals [8,9]. The protein is made up of over essential amino acids, with lysine and Lucien being predominant. It is also rich in antioxidant sand free-

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radical scavengers. In spite of its composition, it has a low consumption rate. This is mainly due to its long cooking time about 145min. [10]

Pigeon pea (*Cajanus cajan*) is a rich source of protein for animal and Human consumption. It also supplies a significant amount of minerals and vitamins. It is among the dry leguminous cultivated for food in Nigeria. It is also an important food legume in African and south – East Asia (11, 12).

Carica papaya Linnaeus (pawpaw leaf), belongs to the family of *caricaceae*. Papaya is not a tree but herbaceous succulent plants that Posses self-supporting stems. [13] It is a large perennial Herb with a rapid growth rate. The plants are usually short-lived, but can produce fruit for more than 20 years. The papaya has a rather complicated Means of reproduction. *Carica papaya* leaf tea or extract has a reputation as a tumors-destroying agent [14]. Fresh, green pawpaw leaf is an antiseptic, whilst the brown, dried pawpaw leaf is the best as a Tonic and blood purifier.[15].

Pawpaw Seed

Carica papaya is known with many other common names such as papaya, papaw, pawpaw, chichpu, mamao and melon tree. It may cultivate for its young leaves, shoots and fruits which are cooked as a vegetable or for its ripe fruit which is well known as a popular beverage. Earlier, it was reported that papaya had positive effect against bacterial in factions. It was found that treatment of wound with *Carica papaya* improved efficiency of phagocytic cells that destroy bacteria. In vitro studies conducted on extracts from skin, flesh, and seeds of both ripe and unripe *Carica papaya* gave antibacterial activities against various microorganisms including *Staphylococcus aureus*, *Bacillus subtilize*, *Bacillus cereus*, *Escherichia coli*, *Enterobacter cloacae*, *Proteus vulgaris*, *Klebsiella pneumonia*, *Salmonella typhi*, *Pseudomonas aeruginosa* and *Shigella Flexner*. Papa in which is the main enzyme found in *Carica papaya* is recognized as effective natural medicine in controlling both edema and inflammation associated with surgical operations. It also produced therapeutic effects in patients with inflammatory disorders of intestine, liver and eye. An aqueous extract of *Carica papaya* was also examined for its effect on growth of various tumor Cell lines and on human lymphocytes and have shown positive significant results. The seeds and the pulp of *Carica papaya* contain benzyl glucosinolate which can be hydrolyzed by myrosinase to produce benzyl isothiocyanate. [16,17,18]

Moringa Oleifera

Is the most widespread species of the plant family *Moringaceae*. It is a rapidly growing tree native to the sub-Himalayan Regions of north-west India and indigenous to many parts of Africa, South America and Asia. Typically reaching a height of 3-4metres, flowering and Fruiting in one year from a 0.3metre seedling even in poor quality soil [19, 20]. It is known by different names around the world [21], for example in India “Drumstick” or “Horseradish” tree. The tree produces large seed pods

which can either be harvested when green for food or left to dry. The dried seeds can be crushed to produce a high-quality vegetable oil and the resulting press-cake mixed with water and strained to form a coagulant for water treatment [22, 23]

MATERIALS AND METHODS

Beaker, Conical flask, Fehling solution, Electric heater, Pipette, Round bottom flask, Volumetric flask, Spectrophotometer, Filter paper, Test tube, Distilled water, Ferric chloride (FeCl_3), Tetraoxosulphate(vi) acid (H_2S_04), Sodium hydroxide, Potassium iodine, Iodine crystal, Methanol, Ethyl acetate, Chloroform, Petroleum ether weighing balance. These materials were obtained from Bro. Mike Researchers Lab. Umuerim Extension Umudibia Nekede. The fresh seeds were thoroughly clean and any foreign materials and broken and immature seeds were removed and Shade dried for three (3) consecutive days to constant weight at room temperature (25–30°C). The seeds were pulverized to fine particle using the laboratory mill. Processing Techniques.[25]

Boiling

A set of AYB seeds (100g) was boiled in distilled water (100°C) in bean: water ratio of 1: 10 (w/v) for 3h and 48 min, which is the established time frame known for it to be ready as practiced by the locals. After boiling, the Water was drained off and the boiled sample was mashed into paste using a ceramic mortar and then stored in an airtight container at 4–6°C until it was used. [26]

Africa Yam Bean

The plant material was collected from the field. The seeds were dried under Shade and made into powder using pestle and mortar. The seeds were moisture for 3hours and then dried in oven at 600C overnight for circulation seed coat. The seeds coat was removed mechanically by using hand grinder. The seeds coat was made into fine powder using material. [27,28]

Seeds of *Cajanus Cajan* (Pigeon Pea)

The seeds of *Cajanus cajan* (pigeon pea) was collected from the field. The seeds were dried under shade and made into fine powder using pestle and mortar. The seeds were moistened for 1h and then dried in oven at 550C overnight for separation of seed coat and cotyledon. The hull or seed coat is removed mechanically by using hand grinder. The two fractions like seed coat and cotyledon are made into fine powder using grinder. [29]

Pawpaw seeds

The plant material was collected from the field. The seeds were dried under shade and made into powder using grinder.

Pawpaw Leaves

The plant material which is fresh green pawpaw leaves, fresh yellow pawpaw leaf dry brown pawpaw leaves were collected. The leaves were washed, cut into small pieces and sun dried for five days. The samples were ground

into powder.

Moringa seeds

The plant material was collected from the field. The seeds were dried under shade and made into powder using pestle and mortar. The seeds were moistures for 2 hours and then dried in oven at 600C overnight for circulation seed coat. The seeds coat was removed mechanically by using hand grinder. The seeds coat was made into fine powder using material.[30]

Phytochemical Analysis

Test for alkaloid

Preparation of Wagner's reagent 1.3g of iodine crystal and 2g of potassium iodine was dissolved and makeup 100ml with water.

Procedure: 1ml of each sample (extract) will be added to 1ml of Wagner's reagent. A brick red shows the presence alkaloid.

Test for tannin

5% of ferric chloride (FeCl_3) was dissolved and makeup to 100ml with distilled water. 20% of potassium hydroxide was dissolved and makeup to 100ml with water then 5ml was added to 1ml of each of the extract in different test

tube. Pipette 3ml of each sample and 3 drop of FeCl_3 and boil for 2 minutes. A blue black indicated the presence of tannin.

Test for flavonoid

Add 3ml of each extract to 1ml of 10% sodium hydroxide. Yellowish colour indicates the presence of flavonoid.

Test for saponin

Add 3ml of each extract to 2ml of 2ml of distilled water with vigorous shaking and boil for two (2) minutes. Stable foaming indicates the presence of saponin.

Test for steroid

Add 5 drops of conc tetraoxosulphate (vi) (H_2SO_4) into 1ml of each of the extract red colour medicates the presence of steroid.

Test of glycoside

Add 5ml of each extract to 5ml of 50% H_2SO_4 with head in water bater for 15minutes, cool for 7minutes, and then add 5ml of Fehling solution and heat for 3minutes red colour indicate the presence of glycoside.

RESULT ANALYSIS

Table 1: Extraction

Solvent	Wt of filtrate(g)	Wt of residue(g)
Methanol	15	21.5
Ethyl acetate	14	22.5
Petroleum ether	12	24.5
Chloroform	13	23.5

Sample	Parameter	Solvent			
Yam Beans	Alkaloid	Water	N-Hexan	Chloroform	Ethanol
		+	+++	++	+++
	Glycoside	+	—	—	—
	Flavonoid	—	+++	+	+
	Steroid	—	+	—	—
	Tannin	—	—	—	—
	Saponin	+	++	+	+

Sample	Parameter	Solvent			
PigeonPea	Alkaloid	Water	N-Hexan	Chloroform	Ethanol
		—	++	—	+
	Glycoside	—	—	—	—
	Flavonoid	—	—	—	—
	Steroid	—	++	+	—
	Tannin	+	—	—	++
	Saponin	+++	—	+	+

Sample	Parameter	Solvent			
Moringa seed	Alkaloid	Water	N-Hexan	Chloroform	Ethanol
		—	++	—	+

	Glycoside	—	—	—	—
	Flavonoid	++	+++	+	+
	Steroid	—	—	—	—
	Tannin	+	—	+	—
	Saponin	+++	—	+	+

Sample	Parameter	Solvent			
Pawpaw leaf	Alkaloid	Water	N-Hexan	Chloroform	Ethanol
		+	+++	+	++
	Glycoside	—	+	+	—
	Flavonoid	—	—	—	—
	Steroid	—	++	+	—
	Tannin	—	—	—	—
	Saponin	++	—	+	+

Sample	Parameter	Solvent			
Pawpaw seed	Alkaloid	Water	N-Hexan	Chloroform	Ethanol
		++	+++	++	++
	Glycoside	—	+	+	—
	Flavonoid	—	+	+	—
	Steroid	—	++	+	—
	Tannin	—	—	—	—
	Saponin	+++	—	+	+

+++ = Highly present

++ = Moderately present

+ = slightly present

- = Absent

DISCUSSION

The leaves and seeds were thoroughly washed, made into fine powder and weighed with a weighing machine; thus, the initial weight of the fine powder is 146g. The powdered material (146g) was weighed into four different conical flasks macerated with four different solvents via methanol, Ethylacetate, chloroform, and petroleum ether. This was left to stand for 24 hours. Then after the filtration and concentration process, methanol extract gives the highest filtrate (15g) and leaTabsidue (21.5g), followed by the ethylacetate extract which gives filtrate (14g) and residue (22.5g). The chloroform ether extract give filtrate (13g) and residue (23.5g) and petroleum ether gives the least filtrate (12g) and highest residue (24.5g). The phytochemical analysis was carried out based on laboratory procedure Bro. Mike Researchers Lab. The preliminary photochemical screening of different solvent revealed the presence of alkaloids, flavonoids, saponins, tannins, steroids and glycosides in methanol extract, the screening further revealed the presence of glycoside in ethylacetate extract, then in petroleum etherextract, the presence of alkaloids, saponins and steroids were revealed and finally the presence of alkaloids, saponins and steroids were revealed in chloroform extract. It is automatically revealed that methanol is the best solvent for the extraction of phytochemical since it does not

affect the presence of any phytochemical meanwhile, alkaloids, Saponins and steroids are not selectivity based on the solvent used for the extraction. The medical and physiological activities of the Yam Beans, pigeon pea, moringa seed, pawpaw seed and pawpaw leaves can be attributed to the presence of the secondary metabolites. It has been known that alkaloids are used for treatment of malaria, diabetes, and hypertension and also used as a tranquilizer. Saponins are also used as tranquilizer, anti-carcinogenic and anti-lipidemic agent. Hence have the ability to stimulate the heart muscle. Flavonoids have been known to be synthesized by plant in response to microbial attack hence; they are effective antimicrobial substance against a wide array of microorganism. Psychotherapeutically, tannin containing plants are used to treat nonspecific diarrhea, inflammation of mouth, throat and slightly injured skin. The medicinal values of plant depend on the phytochemicals such as flavonoids, alkaloids, saponins, tannin. Phytochemical analysis of the pawpaw leaves showed that the leaves contained saponins, cardiac glycosides, and alkaloids. Tannin was absent in the leaves. The presence of saponins supports the fact that pawpaw leaf has cytotoxic effects such as permealization of the intestine as saponins are cytotoxic. It also gives the leaves the bitter taste. Saponin has relationship with sex hormones like oxytocin. Oxytocin is a sex hormone involved in controlling the onset of labour in women and the subsequent release of milk. Another important action of saponins is their expectorant actions through the stimulation of are flex of the upper digestive tract [31, 32]. Alkaloids are the most efficient therapeutically

significant plant substance. Pure isolated alkaloids and the synthetic derivatives are used as basic medicinal agents because of their analgesic, antispasmodic and bacterial properties. [33]. They show marked physiological effects when administered to animals. The presence of alkaloids in the leaves shows that these plants can be effective anti-malaria, since alkaloids consist of quinine, which is an anti-malari.

CONCLUSION

The flavonoid and alkaloid maybe the potential chemo preventive and anticancer substances. Furthermore, Pigeon pea, yam bean, moringa seed Pawpaw seed and pawpaw leave have been found to contain most of the bioactive constituent spresent in plant via alkaloid, saponin, tannins, flvonbid, steroid and glycoside. Pigeon pea, moringa seed, yam bean, pawpaw seed and pawpaw leave are very good medicinal plant used in the treatment of maleria, cancer, cough hypertension etc they also aid digestion and enable the nourishment of skin. From the analysis of the phytochemical it can be concluded that methanol is the best solvent for the extraction of the phytochemical followed by the ethylacetate. It is also considered carry dry under room temperature in order not to temper the presence of the constituent.

The result of this study showed that the Yam bean seeds had better nutritional profile with high level of protein, carbohydrate lipid, minerals and other nutrients as compared with the other nutrients in the legume grains. The processing of the yam bean seeds reduced its level of ant nutrients with little effect on the nutritional quality.

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